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Author(s)	Yamaguti, Satyu
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STUDIES ON THE HELMINTH FAUNA OF JAPAN

PART 52. TREMATODES OF FISHES, XI

SATYU YAMAGUTI

Department of Parasitology, Okayama University Medical School, Okayama

With Plates XIV-XV

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AEROBIOTREMATIDAE n. fam.

1. *Aerobiotrema muraenesocis* n. g., n. sp.

(Pl. XIV, Figs. 4-6; Pl. XV, Fig. 10)

Habitat: Air-bladder of *Muraenesox cinereus*.

Material and locality: Two mature specimens; Tamano Aquarium at Shibukawa, Tamano City, Okayama Prefecture.

Body plump 13.5 mm long¹⁾, rounded at two extremities; the hemispherical posterior region covered with smooth cuticle is delimited from the main body by a distinct circular ridge as shown in the free-hand sketch (Fig. 10). Forebody tapered anteriorly and curved a little ventrally; cuticle thick, transversely wrinkled ventrally, especially at the acetabular level. Between the genital pore and the acetabulum is a transversely elongated shallow depression clearly recognizable with a hand lens. On the sectioned preparations the body parenchyma consists of an outer layer of comparatively fine network of connective fibrils and an inner layer of spongy network of coarser fibrils, the open spaces of which contain very fine granules precipitated by SCHAUDINN's fixative with glacial acid added. The oral and ventral suckers, pharynx, esophagus, terminal genitalia and peripheral uterine coils are embedded in the dense peripheral layer, while the other reproductive organs, intestinal ceca and excretory vesicle occupy the spongy central parenchyma.

Oral sucker spherical, 1.7–2.1 mm in diameter, subterminal, with overhanging preoral lip formed by body wall, directly followed by muscular pharynx 0.9 mm long by 0.96 mm broad. Esophagus constricted at very beginning, but greatly expanded elsewhere, directed posterodorsally and then turning ventrad to bifurcate behind pharynx. Ceca very wide throughout their length, with sinuous walls, forming an abrupt turn in front of testes, and encircling the latter, behind which they form another acute turn to encircle the ovarian complex, finally terminating blindly at posterior extremity near dorsal cuticle. Acetabulum spherical, embedded in body parenchyma about one-third of body length from anterior extremity.

Testes rounded rectangular in lateral view, 3.3 mm in greatest dorsoventral diameter, lying in direct contact with each other behind level of acetabulum between two ceca, surrounded dorsally by uterine coils, each giving off its own vas efferens from near anterodorsal corner. Two vasa efferentia running forward convergently, uniting to form elongate sigmoid vesicula seminalis, which is wider distally than proximally, attaining maximum width of 0.4 mm. Pars prostatica 0.7 mm long, widest (0.25 mm) at base, surrounded by flask-shaped compact mass of gland cells, situated dorsoventrally about midway between pharynx and acetabulum, followed by comparatively short (0.4 mm long) ejaculatory duct which is lined with thick smooth cuticle and opens along with the metraterm into the ductus hermaphroditicus. The latter, appearing as a direct continuation of the metraterm, is 0.7 mm long by 0.15 mm wide and opens outside in the median line a little behind the mouth aperture.

Ovary small, ovoid, 0.8×0.4 mm, situated about middle of posterior portion demarcated from main body, left of shell gland, with long axis dorsoventral. Shell gland large, enclosed in fibrous capsule in front of distal end of ceca; ootype large, surrounded by radiating gland ducts; receptaculum seminis and Laurer's canal absent. The uterine duct, winding in the spongy parenchyma on the left of the ovary, proceeds

1) Unless otherwise stated, all measurements are from specimens subjected to coverglass pressure when fixed with SCHAUDINN's solution.

toward the periphery; after forming a transverse coil on the right of the ovarian complex the uterus turns back to the left side and extends longitudinally, occupying the whole ventral area between the posterior extremity and the testes, then running dorsad behind the testes forms two longitudinal loops on the dorsal side of the testes and ceca. Finally it comes to lie in front of the testes, where the terminal uterus passes between the two vasa efferentia and leads into the metraterm beside the pars prostatica. Metraterm 1.0 mm long, lined with thick smooth cuticle and provided with inner circular and outer longitudinal muscles. Eggs round, embryonated, 16–18 μ in diameter. Vitellaria divided into bunches of large rounded follicles, extending longitudinally on each side of ovarian complex, between the latter and ceca, as well as in intercecal field just posterior to testes.

Excretory vesicle Y-shaped in general pattern; the stem originating from the terminal pore ascends in the central region, then on the left of the ovarina complex, and bifurcates at the level of the anterior end of the vitellaria; two arms apparently uniting dorsal to pharynx, sending off numerous, long or short, partly anastomosing, side branches, most of which lie close to the ceca medial, ventral, or lateral to them.

This genus is characterized by the main body being demarcated from the hemispherical posterior extremity by a circular ridge, and by the vitellaria forming grape-like bunches of large follicles and being confined to the post-testicular intercecal field, and by the Y-shaped excretory arms being provided with numerous side branches running parallel to the winding ceca. In view of these characteristics it undoubtedly represents a distinct family, though resembling *Isoparorchis* SOUTHWELL, 1913, in gross internal anatomy and habitat.

The new family, for which Aerobiotrematidae is proposed, is defined as follows and placed near the Isoparorchidae.

AEROBIOTREMATIDAE n. fam.

Family diagnosis.—Digenea with ventral acetabulum. Body robust, plump, with posterior region marked off from main body by circular ridge. Body parenchyma divided into dense peripheral layer and spongy central layer. Oral sucker and pharynx well developed, ceca sinuous. Acetabulum near anterior extremity. Testes juxtaposed, postacetabular. Vesicula seminalis and prostatic complex strongly developed, hermaphroditic duct present. Genital pore median between two suckers. Ovary compact, near posterior extremity. No Laurer's canal. Vitellaria forming grapelike bunches of large follicles, extending in posttesticular field. Uterus strongly distended with eggs, occupying all available space posterior, dorsal and anterior to testes; metraterm well differentiated. Excretory vesicle Y-shaped in general pattern, with arms uniting anteriorly and provided with numerous side branches running parallel to ceca. Parasitic in air bladder of fishes.

Type genus: *Aerobiotrema*¹⁾ n. g.

1) Refers to the habitat.

Aerobiotrema n. g.

Generic diagnosis.—Aerobiotrematidae: With characters of family. Oral sucker subterminal, directly followed by pharynx, esophagus turned back on itself; ceca very wide, with sinuous walls, terminating blindly at posterior extremity. Acetabulum smaller than oral sucker, nearly one third of body length from anterior extremity, not prominent over ventral surface. Testes voluminous, juxtaposed behind acetabulum; seminal vesicle elongate, winding behind intestinal bifurcation; pars prostatica surrounded by dense mass of prostate cells; ductus ejaculatorius joining metraterm to form hermaphroditic duct. No cirrus pouch. Genital pore about halfway between two suckers. Ovary situated beside shell gland near posterior extremity. Neither receptaculum seminis nor Laurer's canal. Uterus strongly distended with eggs, winding posterior, dorsal and anterior to testes; metraterm in direct continuation of hermaphroditic duct; eggs small, round, embryonated. Excretory vesicle Y-shaped; arms with numerous side branches, uniting dorsal to pharynx. Parasitic in air bladder of teleosts.

Genotype: *A. muraenesocis* n. sp.

ALLOCREADIIDAE STOSSICH, 1903

2. *Helicometra epinepheli* YAMAGUTI, 1934

Ten mature specimens, collected from the small intestine of *Epinephelus akaara* on September 8 at Sibukawa, Okayama Prefecture, gave under cover glass pressure the following measurements in mm, which will serve to extend the range of variations given in my original description.

Body $1.5-3.5 \times 0.5-1.1$; oral sucker $0.14-0.19$ in diameter, prepharynx $0.03-0.06$; pharynx $0.06-0.13 \times 0.05-0.09$; esophagus $0.11-0.2$ long; acetabulum $0.2-0.25$ in diameter; testes $0.12-0.42 \times 0.3-0.61$; cirrus pouch $0.3-0.6 \times 0.05-0.1$; ovary $0.1-0.25 \times 0.25-0.36$; receptaculum seminis $0.07-0.13$ wide; eggs $47-54 \times 27-30 \mu$.

3. *Opelcoelus lateolabracis* n. sp.

(Pl. XIV, Fig. 3)

Habitat: Small intestine of *Lateolabrax japonicus*.

Material, locality and date: Four gravid specimens; Inland Sea; Sept. 7, 1957.

Body slender, $1.6-2.3$ mm long by $0.14-0.22$ mm broad, covered with thin smooth cuticle; forebody tapering anteriorly, hindbody cylindrical, with uniform width of $0.14-0.22$ mm, rounded at posterior extremity. Oral sucker terminal, $54-58 \times 47-70 \mu$, with subterminal aperture; prepharynx $10-56 \mu$ long, pharynx barrel-shaped, $31-44 \times 26-40 \mu$; esophagus $0.065-0.14$ mm long, bifurcating just anterior to base of acetabulum. Ceca narrow, united posteriorly and opening ventroterminally. Acetabulum projecting prominently, $0.11-0.156$ mm in diameter, situated close to anterior extremity,

with 6, sharp-pointed, solid, horn-like, marginal projections, 3 on anterior margin and 3 on posterior margin.

Testes oval, $0.11-0.15 \times 0.07-0.11$ mm, separated one from the other by vitellaria, situated in middle third of body or a little more posteriorly. Seminal vesicle elongated claviform, with maximum width of $33-56 \mu$, extending posterior to acetabulum. Prostatic cells reduced around attenuated distal portion of seminal vesicle. Cirrus pouch slender, subcylindrical, 78μ by 15.6μ wide in the type, reaching as far backward as level of anterior end of acetabulum, enclosing small oval pars prostatica at its base. Genital pore to left of median line just in front of intestinal bifurcation.

Ovary reniform or trilobate, with concavity in front, $23-44 \mu$ by $78-114 \mu$, situated transversely in front of anterior testis, from which it is separated by vitellaria. No receptaculum seminis, Laurer's canal opening dorsally posterosinistral to ovary. Uterus winding between preovarian shell gland and base of seminal vesicle, whence it takes a straight ascending course along with seminal vesicle. Eggs oval, $62-65 \mu$ in diameter in whole mounts, comparatively few in number. Vitellaria extending in lateral fields between level of posterior end of seminal vesicle and posterior extremity, confluent in posttesticular area. Excretory vesicle simple, tubular, with terminal pore.

This species differs from the most closely related *O. sebastodis* YAMAGUTI, 1934, in the marginal appendages of the acetabulum being sharp-pointed, the seminal vesicle not being bipartite, and the opening of the Laurer's canal being submedian instead of median; the eggs are $75-92 \mu$ long by $45-63 \mu$ broad in *sebastodis*, but $62-65 \mu$ long by $41-43 \mu$ broad in the present species.

4. *Opecoelus sebastisci* n. sp.

(Pl. XV, Fig. 11)

Habitat: Small intestine of *Sebastiscus marmoratus*.

Material and locality: One gravid specimen (April 30, 1957) and three gravid specimens (Sept. 9, 1957); Inland Sea.

Body subcylindrical to fusiform, flattened, blunt-pointed at extremities, unarmed, $1.75-3.5$ mm long by $0.3-0.58$ mm broad. Oral sucker spherical, $0.1-0.14$ mm in diameter, with ventroterminal aperture. Prepharynx distinct, pharynx barrel-shaped, $70-83 \times 41-80 \mu$; esophagus short, $0.065-0.12$ mm long, lined with cuticle throughout its length, bifurcating in front of base of acetabulum; ceca united posteriorly and opening ventrally at posterior extremity. Acetabulum short-stalked, $0.14-0.21$ mm in diameter, at about middle of anterior third of body, with six blunt digitiform marginal appendages.

Testes subglobular, more or less indented, $0.11-0.28 \times 0.2-0.41$ mm; anterior testis equatorial or postequatorial, separated by vitellaria from posterior testis as well as from ovary. Vesicula seminalis winding, with maximum width of $52-70 \mu$ at its cylindrical posterior portion; prostatic cells surrounding attenuated distal portion of

seminal vesicle. Small oval pars prostatica and proximally winding cirrus enclosed in club- or retort-shaped cirrus pouch 0.12–0.2 mm long by 39–50 μ wide. Genital pore on the left of esophagus.

Ovary coarsely trilobate, transversely elongated, 0.065–0.14 mm long by 0.2–0.32 mm wide, pre-equatorial, nearly median; germiduct sinuous, giving off Laurer's canal in front of ovary, and uniting with vitelline duct anteromedial to vitelline reservoir. Laurer's canal originating from germiduct in front of ovary, describing a loop and opening dorsal to ovary immediately posterior or posteromedial to vitelline reservoir. Uterus convoluted in intercecal field between shell gland and level of posterior portion of seminal vesicle, and then running straight forward; metraterm well differentiated, crossing cirrus pouch dorsally; eggs oval, 56–65 \times 30–35 μ in life. Vitellaria occupying lateral fields between level of posterior end of seminal vesicle and posterior extremity, confluent in posttesticular region. Excretory vesicle tubular, reaching to ovary; pore terminal.

This species resembles *Opecoelus nipponicus* YAMAGUTI, 1951, in general body shape, but differs from it in the length of the cirrus pouch. That the Laurer's canal opens dorsal to the ovary behind the vitelline reservoir is also worth noting.

5. *Opecoelus pagrosomi* n. sp.

(Pl. XV, Fig. 12)

Habitat: Small intestine of *Pagrosomus unicolor*.

Material, locality and date: 3 gravid specimens; Inland Sea; Sept. 7, 1957.

Body lanceolate 1.65–1.7 mm long by 0.48–0.52 mm wide, unarmed. Oral sucker subterminal, spherical, about 0.14 mm in diameter; prepharynx 30–40 μ long, pharynx barrel-shaped, 70–80 \times 60–65 μ . Esophagus 80–100 μ long; ceca united posteriorly and opening ventrally about 70 μ from posterior tip of body in the type. Acetabulum 0.2 mm in diameter, with six conical marginal appendages interlocking with one another, situated at junction of anterior with middle third of body.

Testes irregularly lobed or indented, wider than long, 0.11–0.18 \times 0.26–0.3 mm, directly tandem, posterior one at junction of middle with posterior third of body. Seminal vesicle usually not reaching backward beyond acetabulum, consisting of a cylindrical proximal portion 50–80 μ wide and a much narrower, winding, distal portion surrounded by prostatic cells. Cirrus pouch claviform, 90–100 \times 30–50 μ , with thick wall of inner circular and outer longitudinal muscle fibers, situated obliquely with its base ventral to left cecum, enclosing ovoid pars prostatica and proximally winding cirrus. Genital pore sinistral to esophagus.

Ovary transversely elongated, concave in front, indented behind or not, median or slightly to right of median line, equatorial or postequatorial, 60–90 μ by 0.2–0.24 mm; germiduct tortuous, giving off Laurer's canal at the point, where it turns back toward the left just anterior to the right end of the ovary. Laurer's canal crossing transversely

dorsal to the vitelline reservoir and forms a complete loop just before opening dorsally in front of the left portion of the ovary. Receptaculum seminis uterinum present. Uterine coils confined to intercecal field between ovary and acetabulum; metraterm short, along the left side of cirrus pouch; eggs oval, $56-65 \times 32-39 \mu$ in life. Vitellaria commencing at level of acetabulum or a little in front of it, occupying whole lateral field of hindbody as well as posttesticular region; vitelline reservoir anterodorsal to ovary. Excretory vesicle tubular, median, reaching to ovary; pore terminal.

This species resembles *O. xenistii* MANTER, 1940, very closely, but differs from it in egg size; in MANTER's species the eggs are $50-59 \mu$ by $29-34 \mu$. Since no mention is made about the size of the cirrus pouch and the position of the aperture of the Laurer's canal in *O. xenistii*, a further comparison is not possible.

6. *Opegaster cryptocentri* n. sp.

(Pl. XIV, Fig. 2)

Habitat: Small intestine of *Cryptocentrus filifer*.

Material: A single gravid specimen stained and mounted *in toto*.

Locality and date: Inland Sea; September 9, 1957.

Body flattened fusiform, with rounded ends, 1.6×0.56 mm, widest at level of midbody. Cuticle smooth. In the shoulder region there is on each side a group of unicellular gland cells containing fine secretory granules. Oral sucker terminal, with ventral aperture, 0.18×0.15 mm; prepharynx expanded, with circular and longitudinal muscles; pharynx muscular, 0.1×0.16 mm; esophagus about 0.1 mm long, lined with thick cuticle, with muscular wall; ceca very wide throughout, united posteriorly and opening ventrally very close to posterior end of body. Acetabulum 0.21×0.24 mm, with a transverse row of seven papillae along anterior and posterior margins respectively, situated at third sixth of body; its lateral ends projecting only slightly.

Testes transversely elongated, with a shallow notch on posterior border, directly tandem, at about middle of hindbody; anterior testis 0.1×0.2 mm, at junction of middle with posterior third of body; posterior testis 0.13×0.2 mm. Seminal vesicle retort-shaped, 0.1 mm in diameter, with its expanded portion confined to median field between intestinal bifurcation and acetabulum, and its tapering anterior portion crossing commencement of left cecum ventrally; prostate cells around this portion markedly reduced. Cirrus pouch fusiform, 0.12 mm long, with maximum width of 20μ at level of pars prostatica which is oval and measures only 16μ long by 10μ wide; cirrus (or ejaculatory duct) 36μ by 4.5μ , lined with smooth cuticle. Genital pore just to left of esophagus.

Ovary transversely elongated bean-shaped, 0.07×0.2 mm, immediately in front of anterior testis, slightly to right. The germiduct, originating from the ventral surface of the ovary near its anterodextral corner, follows a sinuous transverse course toward the right, and turns back on itself in front of the right end of the vitelline reservoir,

and then unites with the vitelline duct coming from behind; the ootype lies immediately in front of the ovary to the left of the vitelline reservoir. Uterus coiled between ovary and acetabulum and on the left of the latter; metraterm not appreciably differentiated; eggs oval, $63-73 \times 34-39 \mu$ in life. Vitelline follicles extending in lateral fields of fore- and hindbody, commencing at level of posterior end of esophagus and occupying whole posttesticular median field; vitelline reservoir oval, 0.05×0.1 mm, anterodorsal to right portion of ovary, giving off its efferent duct at its left end.

Excretory vesicle tubular, reaching to dorsal side of ovary; pore terminal.

This species differs from the most closely related *Opegaster beliyai* PANDE, 1937, from *Gobius giuris* and *O. mehrii* HARSHEY, 1937, from *Mastacembelus armatus* in the posterior extent of the seminal vesicle, and from *O. synodi* MANTER, 1947, from *Synodus foetens* in egg size; in MANTER's species the eggs are distinctly smaller, measuring $50-54 \times 30-32 \mu$.

ACANTHOSTOMIDAE POCHE, 1926

7. *Biovarium lateolabracis* n. sp.

(Pl. XV, Fig. 7)

Habitat: Small intestine of *Lateolabrax japonicus*.

Material, locality and date: A single gravid specimen; Inland Sea; Sept. 10, 1957.

Body lanceolate, 1.6 mm long, with maximum width of 0.34 mm at middle, blunt-pointed at two extremities; cuticle beset all over with very fine spines. Subcuticular dermal gland cells scattered throughout body except for two extremities. Residue of larval eye spots scattered in anterior region of body. Oral sucker spherical, 0.13 mm in diameter, opening ventroterminally. Prepharynx 0.1 mm long; pharynx barrel-shaped, $63 \times 52 \mu$, with wide lumen; esophagus only 64μ long; ceca terminating short of posterior extremity, at about middle of posttesticular region. Acetabulum $78 \times 86 \mu$, embedded in body parenchyma at about midbody.

Testes flattened elliptical, directly tandem; anterior testis 0.2×0.1 mm, at junction of middle with posterior third of body, posterior one 0.3×0.1 mm. Seminal vesicle up to 35μ wide, winding posterior and dextral to acetabulum; pars prostatica cylindrical, curved in form of letter S, about 25μ wide; its distal end turns back on itself to be continued into an equally wide cirrus, which opens into the genital atrium ventral to the opening of the metraterm. Genital atrium 28μ in diameter, covered inside with cuticular projections, opening ventrally immediately anterolateral to acetabulum.

Ovary divided into subsymmetrical groups of lobes of irregular outline, situated ventrally about halfway between acetabulum and anterior testis, each group consisting of three or more lobes overreaching ceca laterally. Receptaculum seminis rounded, about 50μ in diameter, situated immediately behind acetabulum ventral to postacetabular portion of seminal vesicle, slightly to right of median line, containing yolk cells; its

backwardly directed duct and the Laurer's canal join the germiduct at the same point just before the latter turns ventrad. Laurer's canal comparatively wide proximally, narrowed and coiled distally and opening dorsally. Proximal portion of uterus winding in intercecal field between ovary and anterior testis, ventral to ceca on each side of anterior and posterior testes, and in posttesticular region, finally ascending straight in median field ventral to anterior testis and dorsal to medial portion of right lobes of ovary, passing immediately behind seminal receptacle from right to left and then ventral and lateral to proximal portion of seminal vesicle to left side of acetabulum; metraterm 18μ long, much narrower than uterus proper, opening into genital atrium from anterosinistral side dorsal to cirrus; eggs oval, light brown, $14.5-17.5 \times 9.5-10\mu$. Vitellaria extending diffusely along ceca from behind intestinal bifurcation to level of anterior part of posterior testis, confluent in intercecal field of forebody; descending vitelline duct just medial to cecum of its own side; ascending duct, however, lateral to cecum of its own side, both meeting mediodorsal to cecum just in front of ovary; transverse ducts uniting behind seminal receptacle; vitelline reservoir opening into germiduct just distal to point of adrupt turn of latter.

Excretory vesicle Y-shaped, bifurcating dorsal to ovary; arms ascending just medial and parallel to ceca and crossing beginning of latter dorsally, terminating one on each side posterolateral to pharynx, where they are markedly dilated in form of a club.

This species differs from *Biovarium cryptocotyle* YAMAGUTI, 1934, from the same host species in more extensive development of the vitellaria in the forebody and in the ovary being divided into two groups of lobes instead of two compact masses; moreover the eggs are definitely smaller in the present species than they are in the genotype. There is no genitoacetabular pocket as observed in *B. cryptocotyle*. The saccular organ indicated as vesicula seminalis in Figure 57 of *Biovarium cryptocotyle* is undoubtedly a seminal receptacle, and my previous account that the pars prostatica and cirrus are lacking is erroneous in view of the present observation made on the HEIDENHAIN's preparation, on which morphological details can be worked out more accurately than on hematoxyline-eosin preparations. With the addition of a second species of the genus the generic diagnosis given in my original description of 1934 as well as that of 1953 and 1958 in *Systema Helminthum* Part I and Vol. I, respectively, must be emended so far as the genito-acetabular pocket and male terminal genitalia are concerned.

ACANTHOCOLPIDAE LÜHE, 1909

8. Adolescaria of *Stephanostomm pagrosomi* YAMAGUTI, 1939

Habitat: Encysted on inner surface of swim-bladder of *Ditrema temmincki*.

Locality and date: Inland Sea; September 7, 1957.

Large numbers of *Ditrema temmincki* were examined and almost every one of them was found heavily infected with this adolescaria folded upon itself in the cyst. The

worm was dissected out of the cyst, and straightened out and fixed under a cover slip.

Body retort-shaped, 1.35–1.7 mm in length, 0.64–0.78 mm in maximum width at level of anterior testis, posterior expanded portion occupied by excretory vesicle. Cuticle spined all over except behind oral sucker, where the spineless area is very narrow dorsally but triangular ventrally. A pair of larval eye-spots in neck region. Oral sucker terminal, saucer-shaped, 0.09–0.11 mm by 0.15–0.16 mm, with two alternating rows of 25–27 spines each; ventral spines 29–34 μ long, without any appreciable size difference in the two rows; dorsal spines, especially aboral ones, are somewhat smaller. Prepharynx 0.2–0.24 mm long, pharynx barrel-shaped, 0.12–0.14 \times 0.08–0.11 mm, esophagus only 30–80 μ long, lined with thick cuticle; ceca wide, pressed against body wall by swollen excretory vesicle and terminating blindly close to each other at posterior extremity. Acetabulum 0.22–0.25 mm in transverse diameter, pre-equatorial.

Testes subglobular to oval 0.06–0.18 mm long by 0.1–0.16 mm wide, tandem in posterior third of body ventral to excretory vesicle, anterior vas efferens passing dorsal to ootype, posterior one running along right border of anterior testis, both meeting at posterior end of cirrus pouch. Cirrus pouch long and slender, reaching to near ovary; seminal vesicle cylindrical, about 70 μ long by 25 μ wide, followed by short pars prostatica of nearly the same diameter; ejaculatory duct nearly half as wide as seminal vesicle, winding, surrounded throughout its length by prostate cells, joining metraterm dorsal to acetabulum and forming hermaphroditic duct, which in turn opens midventrally immediately in front of the acetabulum.

Ovary subglobular, 41–56 μ by 62–65 μ , situated anterodorsal to right end of anterior testis; the germiduct arising from the dorsal side of the ovary turns back on itself and gives off the Laurer's canal near its origin, and then unites with the duct from the vitelline reservoir; the ootype lies on the left of the ovary; Laurer's canal opens dorsally in front of the ovary; the initial uterine duct is convoluted anterodorsal to the left end of anterior testis; the distal portion of the uterus commencing at the level of the posterior end of the cirrus pouch is provided with well developed longitudinal muscle fibers and a thick coat of glandular accompanying cells. Vitelline anlagen scattered in cecal and intercecal fields posterior to level of ovary in form of small irregular masses of yolk cells, but not recognizable as such anterior to this level.

Excretory vesicle occupying whole intercecal area from posterior extremity to level of ovary, pushing ceca laterally, testes ventrally and ovary dorsally or anterodorsally.

From marked resemblance in general anatomy, especially in the number of the circumoral spines and the ovarian complex it is almost certain that this adolesearia may be referred to *Stephanostomum pagrosomi* YAMAGUTI, 1939. This assumption is supported by the fact that *Pagrosomus unicolor*, the definitive host of this trematode, is known to be a voracious fish. The communication between the cecal ends and the excretory vesicle must take place in the definitive host.

CRYPTOGONIMIDAE CIUREA, 1933

9. *Diplopharyngotrema lateolabracis* n. g., n. sp.

(Pl. XV, Fig. 9)

Habitat: Small intestine of *Lateolabrax japonicus*.

Material: 2 mature specimens (type specimen entire, syntype damaged when collected).

Locality and date: Inland Sea; September 10, 1957.

Body slender, subcylindrical, covered with smooth cuticle, 5.6 mm long, 0.52 mm broad at anterior extremity in the type, blunt-pointed at posterior extremity. Oral sucker terminal, funnel-shaped, $0.44-0.48 \times 0.47-0.52$ mm, with very wide aperture, the ventral margin of which presents a marked triangular median and shallow paired submedian incisions, the margin between the median and submedian incisions projecting forward in form of an obtuse triangular lobe. Prepharynx unusually expanded, 0.6 mm long by 0.37 mm wide, enclosing anterior part of pharynx at its base, with larval eye pigments scattered on each side. Pharynx cylindrical, $0.2-0.22 \times 0.17-0.24$ mm, divided by a slight transverse constriction into two unequal parts; anterior part with funnel-shaped lumen, provided with very strong outer circular muscle; posterior part weakly muscular, with wide lumen gaping backwardly. Esophagus very wide, 0.15–0.2 mm long, bifurcating a short distance anterior to acetabulum; ceca simple, reaching to near posterior extremity. Acetabulum small, 0.13–0.14 mm in diameter, embedded in parenchyma in second sixth of body.

Testes longitudinally elongated oval, $0.3-0.5 \times 0.22-0.3$ mm, dorsal, wide apart; anterior equatorial, posterior at anterior end of posterior third of body. Seminal vesicle cylindrical, 50–60 μ wide, winding between acetabulum and seminal receptacle, followed by wide cylindrical muscular pars prostatica. The wide ductus ejaculatorius turns back on itself and opens into the genital atrium at its anterior end. Genital pore median, immediately preacetabular.

Ovary multilobate, $0.13-0.15 \times 0.25-0.26$ mm, median, in anterior part of middle third of body, overreaching ceca laterally; the germiduct arising from the anterior middle part of the ovary proceeds forward and after joining the seminal receptacle turns back on itself and receives the duct from the vitelline reservoir. Laurer's canal, originating from receptaculum seminis as a direct backward continuation of the latter, opens dorsally a little out of median line at level of anterior end of ovary. Receptaculum seminis rounded, 0.11–0.21 mm in diameter, tapered posteriorly, situated in front of ovary a little to the right; after joining the germiduct it leads directly into the Laurer's canal. Uterine coils first descending as far as posterior extremity and then ascending, covering testes ventrally and occupying nearly all available space posterior to ovary, finally confined to intercecal field between seminal receptacle and acetabulum, overlapping anterior end of seminal receptacle and seminal vesicle

ventrally; metraterm short, narrow, opening into genital atrium at its posterior end; eggs oval, very small, $15-18 \times 8-10 \mu$ as mounted in balsam. Vitellaria follicular, extending in lateral fields from level of pharynx to near posterior testis; transverse vitelline ducts united across posterior end of seminal receptacle or Laurer's canal ventrally. Excretory vesicle obscured by uterine coils.

Although the excretory system was unable to work out, there is no doubt from general anatomy whether this worm belongs to the Cryptogonimidae CIUREA, 1933. Apparently it represents a new subfamily, for which the name Diplopharyngotrematinae is suggested, and should be placed near Biovariinae YAMAGUTI, 1957. The generic name refers to the pharynx consisting of two different parts.

DIPLOPHARYNGOTREMATINAE n. subf.

Subfamily diagnosis.—Cryptogonimidae: Body slender. Oral sucker funnel-shaped, prepharynx very wide and long; pharynx consisting of two parts of different structure. Esophagus wide, short; ceca simple, long. Acetabulum small, embedded in parenchyma, in anterior region of body. Testes tandem, in hindbody. Vesicula seminalis long, winding; pars prostatica present. Genital pore preacetabular. Ovary multilobate, single, pretesticular. Receptaculum seminis and Laurer's canal present. Uterus extending as far back as posterior extremity; eggs numerous, small. Vitellaria follicular, lateral, moderately extensive. Excretory vesicle? Intestinal parasites of marine teleosts.

Diplopharyngotrema n. g.

Generic diagnosis.—Diplopharyngotrematinae: Body flattened cylindrical, unarmed, with larval eye pigments scattered in neck region. Oral sucker funnel-shaped, gaping forward. Prepharynx strongly expanded; pharynx consisting of anterior part with funnel-shaped lumen and strong outer circular muscles, and posterior part with backwardly gaping lumen and without strong outer circular muscles. Esophagus short, wide; ceca reaching to near posterior extremity. Acetabulum small, postbifurcal. Testes oval, wide apart, in midregion of hindbody. Seminal vesicle winding spirally behind acetabulum, followed by cylindrical, muscular pars prostatica and winding ductus ejaculatorius. Genital pore immediately preacetabular, median. Ovary irregularly multilobed, overreaching ceca laterally anterior to fore testis. Receptaculum seminis voluminous, preovarian, produced backward into Laurer's canal. Uterine coils extensive, occupying all available space of hindbody; metraterm short, narrow; eggs oval, very small, light brown, operculate at narrower end. Vitellaria extending in lateral field of hindbody and intruding a little into forebody. Excretory vesicle unknown. Parasitic in intestine of marine teleosts.

Genotype: *Diplopharyngotrema lateolabracis* n. g., n. sp.

10. *Pseudosiphoderoides hapalogenyos* n. g., n. sp.

(Pl. XIV, Fig. 1)

Habitat: Small intestine of *Hapalogenys* sp.*Material*: Three gravid specimens.*Locality and date*: Inland Sea; September 10, 1957.

Body plump, broadly rounded in front, gradually tapered toward blunt posterior extremity, $3.15\text{--}3.2 \times 1.35\text{--}1.5$ mm. Cuticle thick, unspined, striated perpendicularly. Oral sucker subterminal, $0.2\text{--}0.26 \times 0.3\text{--}0.35$ mm; prepharynx very short, pharynx $0.18\text{--}0.2 \times 0.23\text{--}0.27$ mm in flattened whole mounts, but longer than wide (0.2×0.15 mm) in a section of unflattened specimen. Esophagus practically absent. Ceca comparatively wide, each terminating blindly at a short, equal or unequal distance (0.55 and 0.7 mm respectively in the type) from posterior extremity. Acetabulum $0.23\text{--}0.25 \times 0.24\text{--}0.26$ mm, muscular, embedded in body parenchyma a little behind intestinal bifurcation, and covered up by a fold of body wall which contains circular muscle fibers and has a large oval opening $0.18\text{--}0.26$ mm in greater transverse diameter.

Testes rounded, $0.3\text{--}0.4$ mm in diameter, situated somewhat diagonally dorsal to ceca in anterior part of posterior half of body. Seminal vesicle twisted, largely posterolateral to acetabulum, with maximum width of $0.17\text{--}0.2$ mm. Pars prostatica well differentiated, about $50\ \mu$ in diameter, anterodorsal to acetabulum; short ejaculatory duct opening with uterus into base of pocket enclosing acetabulum; prostatic cells strongly developed in vicinity of pars prostatica, especially on its right side.

Ovary median, ventral, equatorial, divided into numerous claviform lobules; seminal receptacle ovoid, $0.25\text{--}0.3$ mm in diameter, median or slightly submedian, immediately preovarian. Laurer's canal winding, opening dorsally in right submedian line at level of posterior end of ovary or immediately behind it. Vitellaria forming bunches of follicles in acetabulo-ovarian zone dorsal and lateral to ceca, partly intruding mesad dorsally. Uterus winding ventromedial to testes and coiling backward from side to side, overreaching ceca laterally, and then turning forward near posterior extremity to take a sinuous ascending course on the left half of the body up to the level of the seminal receptacle or seminal vesicle, where it passes to the right ventral to the seminal receptacle and is thrown into convolutions on the ventral side anterior to the right testis; finally returning to the median field it runs forwards ventromedial to the seminal vesicle to open into the above mentioned genito-acetabular pouch. Eggs oval, light to dark brown, $18\text{--}21 \times 11\text{--}13\ \mu$.

Excretory vesicle Y-shaped, with terminal pore; stem very wide, bifurcating at level of posterior end of ovary; arms also wide, terminating at level of pharynx.

This genus differs from the most closely related *Siphoderoides* MANTER, 1940, in the cuticle not being spined, in the seminal vesicle being tubular and sinuous instead of a large undivided sac, in the testes lying dorsal to the ceca, and in the vitellaria extending largely dorsal and lateral to the ceca, and from *Paracryptogonimus* YAMAGUTI,

1934, in the absence of eye spots, body spines and circumoral spines, though resembling in other respects.

Pseudosiphoderoides n. g.

Generic diagnosis.—Cryptogonimidae, Cryptogoniminae: Body medium-sized, plump, unspined. No circumoral spines. Oral sucker larger than acetabulum, sub-terminal. Prepharynx very short, pharynx elongate, esophagus practically absent, ceca terminating short of posterior extremity. Acetabulum small, embedded in parenchyma in anterior half of body and covered up by a circular fold of body wall (genito-acetabular pouch). Testes two, subsymmetrical or diagonal, postequatorial, dorsal to ceca. Seminal vesicle tubular, sinuous, largely postacetabular. Prostatic complex well developed. Neither cirrus nor cirrus pouch. Genital pore median, opening into genito-acetabular pouch immediately in front of acetabulum. Ovary median, multi-lobed, pretesticular, with seminal receptacle immediately in front. Vitellaria follicular, extending largely in acetabulo-ovarian zone lateral and dorsal to ceca. Uterine coils pre- and posttesticular, leaving posterior end of body free; eggs very small. Excretory vesicle Y-shaped. Intestinal parasites of marine teleosts.

Genotype: *P. hapalogenyos* n. sp.

BUCEPHALIDAE POCHE, 1907

11. *Prosorhynchus crucibulum japonicum* n. subsp.

(Pl. XV, Fig. 8)

Habitat: Small intestine of *Conger myriaster*.

Material: A single gravid specimen stained and mounted *in toto*.

Locality and date: Inland Sea; September 8, 1957.

Body shaped like a plump rod, swollen at level of testes, about 2 mm long by 0.7 mm wide. Rhynchus wedge-shaped, 0.38×0.28 mm. Pharynx 90μ in diameter, pre-equatorial. Esophagus 0.15×0.03 mm, intestine 0.2×0.09 mm, directed straight forward, with the blind end a little beyond ovary. Testes oval, $0.2-0.22 \times 0.15-0.16$ mm, situated obliquely one on each side of esophagus. Cirrus pouch 0.53 mm long by 0.2 mm broad, containing sigmoid, cylindrical, seminal vesicle 80μ wide, well developed pars prostatica 0.13 mm wide, and a short cirrus only 80μ long by 20μ wide. Genital atrium 0.2 mm in diameter, with wide ventral aperture 0.3 mm from posterior extremity.

Ovary oval, 0.22×0.13 mm, overlapping right testis dorsomedially; shell gland behind right testis. Uterus winding first between right testis and cirrus pouch, then convoluted between left testis and left vitellaria, finally descending on the left of cirrus pouch as far back as beyond genital pore, where it turns forward to open into the genital atrium; eggs oval, $26-28 \mu$ long by $20-21 \mu$ broad. Vitelline follicles

forming symmetrical groups of 12 and 14 each in shoulder region between rhynchus and testes.

Excretory vesicle tubular, extending on the right of cirrus pouch as far forward as anterior end of cirrus pouch; pore terminal.

This species resembles *Prosorhynchus crucibulum* (RUD.) of NICOLL, 1910, or of OZAKI, 1924, very closely, but differs from it in the shell gland being situated behind the right testis at the level of the pharynx; in OZAKI's specimen the shell gland lies between the ovary and the right testis. The relative position of the testes, ovary and pharynx is subject to great individual variation in the known members of the genus, so that much importance cannot be ascribed to differences in this respect. If the shell gland be also variable in position individually, the present specimen should be referred to *P. crucibulum*, but the contrary seems to be true so far as my experience goes. I would like, therefore, to assign it for the present to a new subspecies, for which the name *Prosorhynchus crucibulum japonicum* is proposed.

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EXPLANATION OF PLATES XIV-XV

PLATE XIV

- Fig. 1. *Pseudosiphoderoides hapalogenyos* n. g., n. sp., ventral view.
 Fig. 2. *Opegaster cryptocentri* n. sp., ventral view.
 Fig. 3. *Opecoelus lateolabracis* n. sp.; forebody in lateral view, hindbody in ventral view.
 Fig. 4. *Aerobiotrema muraenesocis* n. g., n. sp. strongly flattened, lateral view.
 Fig. 5. Longitudinal section of *Aerobiotrema muraenesocis* through terminal genitalia.
 Fig. 6. Transverse section of *Aerobiotrema muraenesocis* through shell gland complex.

PLATE XV

- Fig. 7. *Biovarium lateolabracis* n. sp., ventral view.
 Fig. 8. *Prosorhynchus crucibulum japonicum* n. subsp., ventral view.
 Fig. 9. *Diplopharyngotrema lateolabracis* n. g., n. sp., ventral view.
 Fig. 10. Unflattened specimen of *Aerobiotrema muraenesocis*, free-hand sketch, ventral view.
 Fig. 11. *Opecoelus sebastisci* n. sp.; forebody in lateral view, hindbody in ventral view.
 Fig. 12. *Opecoelus pagrosomi* n. sp., ventral view.

ABBREVIATIONS USED IN FIGURES

A=acetabulum, AN=anus, CP=cirrus pouch, EA=excretory arm, EP=excretory pore, EV=excretory vesicle, GA=genital atrium, GP=genital pore, I=intestine, LC=Laurer's canal, MO=mouth opening, O=ovary, OS=oral sucker, P=pharynx, PR=prostatic cell, R=rhynchus, RS=receptaculum seminis, SG=shell gland, T=testis, U=uterus, VR=Vitelline reservoir, VS=vesicula seminalis, VT=vitelline gland.



